RUBIDIUM-86
HANDLING PRECAUTIONS

^{86}Rb
18.66 d
ß- 1.774
γ 1.077
E 1.774

PHYSICAL DATA

Principal Radiation Emissions[1]

Maximum Beta Energies: 1.774 MeV (91%)
0.698 MeV (9%)

Gamma: 1.077 MeV (9%)

Maximum Range of Beta in Air: 6.4 m (21 ft.)[2]

Maximum Range of Beta in Water: 8 mm (0.3 in.)[2]

Unshielded Exposure Rate at 1 cm from a 1 mCi Point Source: 0.5 R/h[3]

Unshielded Exposure Rate at 1 m from a 1 MBq Point Source: 0.35 nC/kg/h[3]

Half-Value Layer for Lead Shielding: 9.0 mm (0.3 in.)[3]

OCCUPATIONAL LIMITS[4]

Annual Limit on Intake: 500 µCi (18 MBq) for oral ingestion and 800 µCi (30 MBq) for inhalation.

Derived Air Concentration: 3x 10^{-7} µCi/mL (11 kBq/m^3).

DOSIMETRY

The high energy beta emissions from ^{86}Rb can present a substantial skin and eye exposure hazard. The high energy gamma emissions and secondary radiation presents a penetrating external hazard. 25% of uptake of ^{86}Rb is assumed to be transferred to the skeleton and 75% uniformly distributed to all other organs and tissues of the body[4]. ^{86}Rb is retained in the body with a biological half-life of 44 days[4].

DECAY TABLE

Physical Half-Life: 18.66 Days[1]

To use the decay table, find the number of days in the top and left hand columns of the chart, then find the corresponding decay factor. To obtain a precalibration number, divide by the decay factor. For a postcalibration number, multiply by the decay factor.

Days	0	1	2	3	4	5	6	7	8	9
0	1.000	0.964	0.928	0.895	0.862	0.831	0.800	0.771	0.743	0.716
10	0.690	0.665	0.640	0.617	0.595	0.573	0.552	0.532	0.512	0.494
20	0.476	0.458	0.442	0.426	0.410	0.395	0.381	0.367	0.354	0.341
30	0.328	0.316	0.305	0.294	0.283	0.273	0.263	0.253	0.244	0.235

General Handling Precautions for Rubidium-86

1. Designate area for handling ^{86}Rb and clearly label all containers.
2. Store ^{86}Rb behind lead shields.
3. Wear extremity and whole body dosimeters while handling mCi (37 MBq) quantities.
4. Use shielding to minimize exposure while handling ^{86}Rb.
5. Do not work over open containers.
6. Use tools to indirectly handle unshielded sources and potentially contaminated vessels.
7. Practice routine operations to improve dexterity and speed before using ^{86}Rb.
8. Prohibit eating, drinking, smoking and mouth pipetting in room where ^{86}Rb is handled.
9. Use transfer pipettes, spill trays and absorbent coverings to confine contamination.
10. Handle potentially volatile compounds in ventilated enclosures.
11. Sample exhausted effluent and room air by continuously drawing a known volume through membrane filters.
12. Wear lab coat, wrist guards and disposable gloves for secondary protection.
13. Maintain contamination and exposure control by regularly monitoring and promptly decontaminating gloves and surfaces.
14. Use end-window Geiger-Mueller detector, NaI(Tl) detector or liquid scintillation counter to detect ^{86}Rb.
15. Submit periodic urine samples for bioassay to indicate uptake by personnel.
16. Isolate waste in sealed, clearly labeled shielded container and hold for decay.
17. Establish surface contamination, air concentration and urinalysis action levels below regulatory limits. Investigate and correct any conditions which may cause these levels to be exceeded.
18. On completing an operation, secure all ^{86}Rb; remove protective clothing; dispose of protective coverings; monitor and decontaminate self and surfaces; wash hands and monitor them again.

The dose rates due to energetic beta radiation can be much higher than dose rates due to gamma radiation from unshielded ^{86}Rb. Avoid direct eye exposure by interposing transparent shields or indirect viewing. Avoid skin exposure by indirect handling and prompt removal of contaminated protective clothing.

References

1. Kocher, David C., Radioactive Decay Data Tables, Springfield: National Technical Information Service, 1981 DOE/TIC-11026.
2. Kaplan, Irving, Nuclear Physics, New York: Addison-Wesley, 1964.
3. Calculated with computer code 'Gamma' utilizing decay scheme data from Kocher and mass attenuation coefficients for lead and mass energy absorption coefficients for air from the Radiological Health Handbook. Washington: Bureau of Radiological Health, 1970. The HVL reported here is the initial HVL for narrow beam geometry.
4. ICRP Publication 30, Part 2, Limits for Intakes of Radionuclides by Workers. Pergamon Press, Oxford, 1980.

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